

Amendments to the Specification

Please replace paragraph [0001] with the following amended paragraph:

[0001] This application claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 60/256,440 filed December 18, 2000. This application is also a continuation-in-part of co-pending U.S. Patent Application No. 09/742,999 filed December 20, 2000 (now U.S. Patent No. 6,579,510), which is a continuation-in-part of co-pending U.S. Patent Application No. 09/625,710 filed July 25, 2000 (now U.S. Patent No. _____), which claims the benefit under U.S.C. § 119(e) of U.S. Provisional Patent Application No. 60/146,635 filed July 30, 1999.

Please replace paragraph [0037] with the following amended paragraph:

[0037] Cooling zone 30 includes ceramic ferrules 32 embedded in refractory 26 and a tube sheet 34 containing a plurality of thermally conductive tubes 36. The tube sheet 34 is the divider between the process gas and the boiling water at the junction (joints 38) of reactor 10 with waste heat boiler 40. The tubes 36 and tube sheet 34 are preferably made of carbon steel. The tube sheet 34 forces the process gas to go through the inside of the tubes 36. Boiling water surrounds the outside of thermally conductive tubes 36. Since the carbon steel of the tubes and tube sheet cannot withstand the temperatures of the process gas, temperature protection for the metal is necessary in both. In tubes 36 and for most of the tube sheet 34, this protection is afforded by the boiling water. Since the boiling water remains at a constant temperature, and since the metal conducts heat so readily, the tubes and most of the tube sheet attain temperatures only slightly above the temperatures of the boiling water (i.e., about 100°C). This is not the case for the part of tube sheet where the tubes connect at joints 38. Without thermal protection, joints 38 and the first part of the tube would see temperatures far exceeding the safe operating limits for the metal. The refractory covering 26 and ceramic ferrules (tube inserts) 32 provide insulation for these relatively unprotected areas of metal. Thus, only metal surfaces that are adequately exposed to the boiling water will encounter the hottest gases. Tubes 36 extend into waste heat boiler 40, which is preferably similar to a conventional boiler. As shown in **Fig. 3A**, tubes 36 terminate in a common reservoir at the opposite end of waste heat boiler 40, which is connected to condenser 50. Condenser 50 is similar to a conventional sulfur

condenser and receives the partially cooled reacted gases from boiler 40 and terminates with a liquid sulfur outlet and a desulfurized waste gas outlet 54. If the desulfurized gas emerging from outlet 54 contains an unacceptable level of residual H₂S, the system may also include a heater 55 and one or more conventional tail gas converter units 60. Tail gas converter unit 60 includes a tail gas treatment such as sulfur absorbing material 56 and a second sulfur condenser 58 (illustrated in **Fig. 3B**) for further purifying the waste gas stream before it is vented into the atmosphere.

Please replace paragraph [0045] with the following amended paragraph:

[0045] The apparent synergy between Pt and Rh in the catalyst that enhances catalyst stability under SCPOX reaction conditions was also observed under CPOX reaction conditions. The Pt-Rh/Ln catalyst also has superior activity for converting an H₂S stream containing a light hydrocarbon, such as methane, to elemental sulfur and synthesis gas, by way of concurrent CPOX and SCPOX reactions carried out over the same catalyst in a single reaction zone, operating the reactor at hydrocarbon, H₂S and O₂ concentrations and process conditions that favor the formation of both sulfur, CO and H₂, as described in co-owned U.S. Patent ~~Application Nos. 09/742,999~~No. 6,579,510 and U.S. Patent Application No. 09/625,710 (U.S. Patent No. _____), each of which is hereby incorporated herein by reference.

Please replace paragraph [0047] with the following amended paragraph:

[0047] The carbiding process includes exposing the catalyst, in any of the forms described above, to light hydrocarbon (a C₁-C₅ hydrocarbon, preferably methane, ethane, propane or butane) under CPOX reaction conditions as described in 09/625,710 (U.S. Patent No. _____). Preferably this hydrocarbon pre-treatment procedure (referred to herein as "carbiding") is carried out with the catalyst in place in the short contact time reactor. The carbiding treatment includes heating the catalyst to at least 700°C or up to about 1,500°C, preferably in the range of 850°C - 1,300°C, in the presence of the light hydrocarbon. Upon getting the catalyst up to CPOX operating temperature, the flow of hydrocarbon is stopped and the flow of H₂S containing gas is begun for sulfur removal and recovery under SCPOX operating conditions. It is preferable to perform the carbiding treatment before exposing the catalyst to H₂S or other sulfur compound while the catalyst is at a temperature at

which it can chemically react with sulfur or at which sulfur can condense on its active sites. In the carbiding treatment, it is preferable to mix the hydrocarbon with a small amount of oxygen or O₂-containing gas to deter or minimize coking of the catalyst during treatment. The amount of oxygen preferably does not exceed the stoichiometric amount necessary to support catalytic partial oxidation of the hydrocarbon (CPOX reaction), i.e., a carbon:oxygen molar ratio of 2:1. If the catalytic components are also active for catalyzing the CPOX reaction, production of synthesis gas (CO and H₂) may commence during the pre-treatment step upon reaching a temperature sufficient to initiate the reaction. Without wishing to be bound by any particular theory, it is believed that, in the case of a Pt-Rh alloy catalyst, the formation of Rh and/or Pt carbide in which at least a substantial portion of the catalytic metal component exists in the same phase with carbon (e.g., RhC_x or PtC_x), which resists the formation of metal sulfide(s) that can deactivate the catalyst by covering the active centers. Thus, the stability and life of the catalyst on H₂S stream is increased or enhanced by the carbiding treatment.

Please replace paragraph [0056] with the following amended paragraph:

[0056] As an alternative to the foregoing procedure, if the H₂S-rich waste gas contains an appreciable amount of methane or other light hydrocarbon that is desired to be salvaged for use in another process, this included gas, substantially free of or depleted in H₂S can be recovered and then routed to a hydrocarbon utilization process after emerging from condenser 50. This is preferably accomplished by restricting the amount of O₂ in the feed, by using a catalyst that is more favorable for catalyzing the SCPOX reaction than the catalytic partial oxidation of the hydrocarbon (CPOX), and other reaction conditions, as described in co-owned, concurrently filed U.S. Patent Application No. 10/024,679 (~~Attorney Docket No. 1856-09301~~) entitled "Short Contact Time Catalytic Partial Oxidation Process for Recovering Sulfur from an H₂S-containing Gas Stream," the disclosure of which is hereby incorporated herein by reference. As a result, there is minimal direct stack emission from the sulfur recovery unit into the air surrounding the plant.

Please replace paragraph [0057] with the following amended paragraph:

[0057] Alternatively, if it is desired that the salvaged methane or other light hydrocarbon be used for the production of synthesis gas, it may be preferable to instead convert the H₂S-containing

hydrocarbon stream directly to elemental sulfur and synthesis gas, by way of concurrent CPOX and SCPOX reactions carried out in a single reaction zone over a catalyst that is active for promoting both types of partial oxidation reactions. In that case, the reactor is operated at hydrocarbon, H₂S and O₂ concentrations and process conditions that favor the formation of both sulfur, CO and H₂, as described in co-owned, co-pending U.S. Patent ~~Application Nos. 09/742,999~~No. 6,579,510 and U.S. Patent Application No. 09/625,710 (U.S. Patent No. _____), each of which is hereby incorporated herein by reference.